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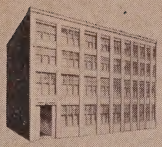

Subsidiary
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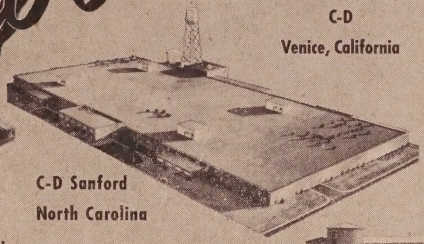
Cleveland, Ohio

C-D
Venice, California



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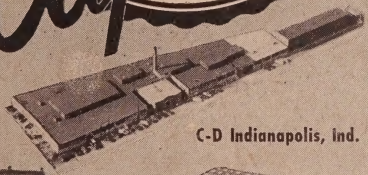
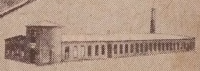
North Carolina



C-D Indianapolis, Ind.



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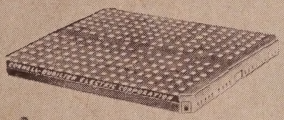

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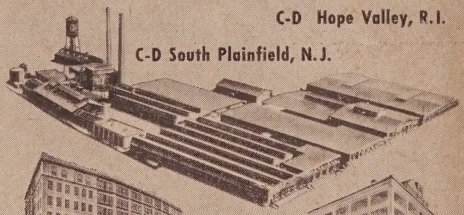

C-D South Plainfield, N.J.

C-D
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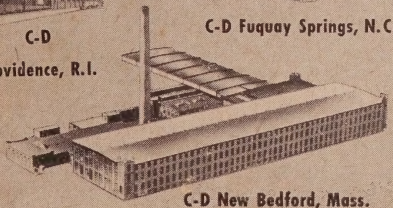

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SEMICONDUCTOR REGULATED POWER SUPPLIES

The important position of electronically-regulated d-c power supplies of the vacuum-tube type has been established for a number of years. Free from moving parts, large saturable iron-core components, and complex adjustments, these supplies are compact and fast-responding. Small-sized, voltage regulated supplies regularly are integrated into instruments requiring close stabilization of operating voltages.

Most conventional voltage regulated supplies have been limited to d-c output voltages above 70. This has been dictated largely by the high anode voltages required by the tubes used in the regulator circuits. In general, low-voltage d-c supplies, such as those based upon semiconductor rectifiers, have lacked a simple electronic means of d-c output-voltage regulation. Lately, however this picture has been changed by the power transistor and the silicon junction voltage-reference diode.

This article describes several electronic voltage regulator circuits employing semiconductor devices. When these circuits are added to basic power supplies containing semiconductor rectifiers (germanium, selenium, or silicon), completely tubeless, regulated supplies are obtained. At low voltage levels, such power supplies offer numerous advantages which are obvious.

Silicon Junction Reference Diode

The conduction characteristic of the silicon junction diode differs strikingly from that of the more familiar germanium and point-contact silicon diodes. First, is the unusually high back resistance. The silicon junction diode passes a much lower reverse current at low voltages than do other types. For example, **Texas Instruments** Type 601C passes only 0.04 microampere at —10 volts. This corresponds to a reverse resistance, R_b, of 250 megohms. (Compare with 75 ua at —10 v for the 1N281 germanium diode; R_b = 133,-333 ohms.) This approaches the open-circuit condition of a true switch. Secondly, this low reverse current flows up to a certain critical value of applied voltage at which the reverse current rises suddenly and sharply, often reaching a value of 10 to 20 ma within a few tenths of a volt differential and corresponding to a reverse resistance of 300 ohms in some instances. The point at which this rapid rise starts is termed the **breakdown voltage** or **Zener voltage.**

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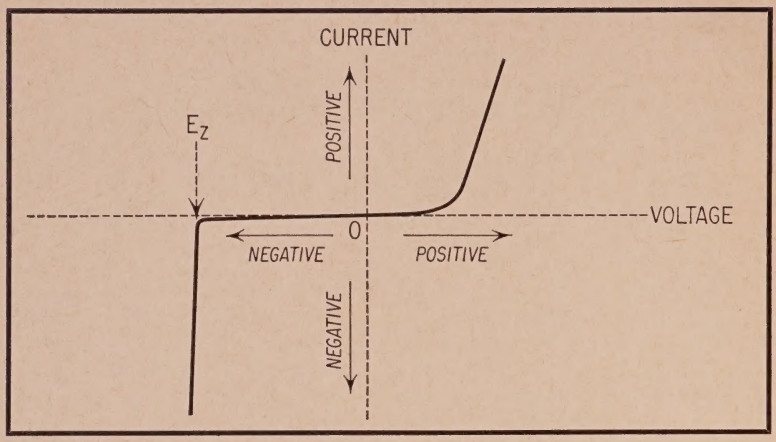


Fig. 1. Silicon Junction Diode Characteristic.

Figure 1 shows the typical characteristic curve of a silicon junction diode. In this plot, note that the reverse current has an extremely low value, practically following the zero coordinate, between the zero origin and the Zener voltage, E_z, and that the sharp increase in current at the Zener point is almost instantaneous. It resembles the breakdown of a gaseous tube.

Junction silicon diodes are processed to yield Zener points at various selected voltages. Thus, either low or high voltage breakdown ratings are obtained by diode type. Because the slope of the breakdown portion of the reverse current curve is very steep, the voltage across the junction in the Zener region varies only a small amount for a rather large change in junction current and may be considered constant. This characteristic permits use of the silicon junction diode as a simple voltage reference device when it is biased in the Zener region.

Diode-Type Regulator

The simplest electronic voltage regulator has been a gaseous diode tube connected in series with a current-limiting resistor — the familiar VR-tube circuit. Here, the constant voltage drop across the tube during its arc discharge furnishes the regulated output voltage.

Comparable regulating action may be obtained with a reverse-biased silicon reference diode and limiting resistor, as shown in Figure 2. With the D-C OUTPUT terminals open-circuited, resistor R is adjusted for a current sufficient to bias the diode in its Zener region. As an external load subsequently draws current from the circuit, the diode current adjusts itself to keep the voltage drop across

the resistor reasonably constant. Similarly, when the input voltage varies, the corresponding variations in diode current, being along the steep Zener section of the diode characteristic, cause only a small variation in the d-c output voltage across the diode.

The maximum input or output current variation which can be tolerated, with the output voltage maintained within the range of regulation, is that value which reduces the voltage drop across resistor R to the Zener voltage amplitude.

The Raytheon 1N437A voltage regulator diode indicated in Figure 2 has a Zener voltage of 6.0 v ± 1 v and can dissipate 150 milliwatts at 25°C. The average Zener current is 20 milliamperes. The output resistance of this regulator is of the order of 10 ohms. Raytheon Type 1N439A voltage regulator diode may be employed with 17 volts input for 10 volts output.

The maximum d-c output of this simple, diode-type regulator circuit is 20 milliamperes. Voltage regulation is of the order of 4 percent. It is interesting to note that other silicon junction diodes are available commercially with Zener voltages up to 300 volts.

Shunt-Type Transistor Regulator

Like the VR-tube voltage regulator, the simple diode-type circuit offers only a moderate degree of regulation and is restricted to relatively low output-current levels. Within its capabilities, however, it is entirely practical.

In order to obtain closer regulation, it is necessary to amplify the "error" voltage and employ the amplified product to correct the output voltage. In order to obtain higher output currents, the control devices in the circuit must be selected for high current and power dissipation ratings. In a tube-type regulator, d-c amplification is provided by a high-gain voltage amplifier pentode, and the control element is a power-type triode or pentode tube. In a semiconductor-type regulator, the d-c amplification may be supplied by a conventional transistor and the control function by a power transistor. (In some applications involving high-current output, both transistors must be of the power type.)

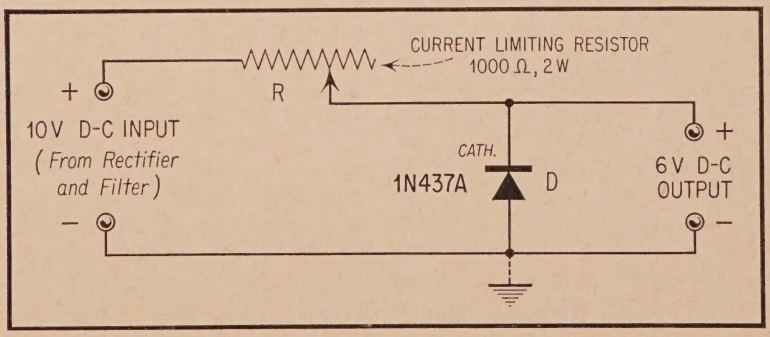


Fig. 2. Simple Diode-Type Voltage Regulator.

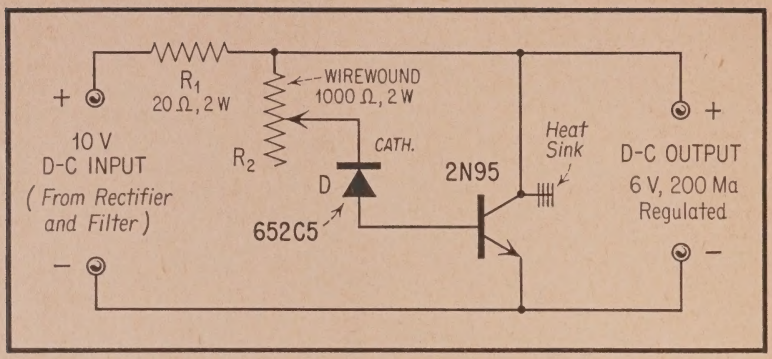


Fig. 3. Shunt Transistor-Type Voltage Regulator.

Figure 3 shows the circuit of a representative voltage regulator employing an NPN power transistor (Sylvania 2N95) as the shunt regulating element and a low-voltage reference diode (Texas Instruments Type 652C5) as the control element. The base-to-collector current amplification (beta) of the transistor provides the control sensitivity which improves this circuit over the simpler one shown in Figure 2.

In this arrangement, a relatively small current flowing through the diode and into the base-emitter input circuit of the transistor causes a much larger current to flow in the collector-emitter output circuit. This current also ideally is equal to the product of beta times the input current. Diode D is a low-voltage silicon junction reference diode. It consequently passes virtually no current until the positive voltage (reverse bias) at its cathode equals the Zener voltage. From this point on, it passes a current into the base of the transistor.

The collector-emitter path of the transistor shunts the D-C OUTPUT terminals. This shunting effect is the final regulating mechanism. For example: If the external load current is decreased, the d-c output voltage tends to increase. The voltage drop across resistor R also decreases. This causes the cathode voltage of the diode to increase and more current is passed into the base of the transistor. This current, in turn, is amplified by the transistor to produce a large collector current change which then increases the current through R, raising the IR drop across the latter and reducing the collector (and d-c output) voltage.

Resistor R_2 is adjusted for Zener current flow through the diode and base circuit of the transistor. Output-voltage variations picked up from the high output line by R_2 then produce corresponding changes in the Zener current. These current changes into the base of the transistor alter the shunting effect of the collector circuit and regulate the output voltage.

High-Current Series-Type Transistor Regulator

Figure 4 shows the circuit of a 6-volt, 3-ampere, power-line-operated, regulated power supply employing semiconductors throughout. This arrangement is the counterpart of the conventional tube-type regulated supply and has been developed along the lines of an original design by Sherr and Levy.[1]

In this circuit, the control element (the electronic variable resistor) consists of the two parallel-connected PNP power transistors, V_1 and V_2 (Sylvania 2N68). The d-c amplifier is an NPN power transistor, V_3 (Sylvania 2N95). And the voltage reference device for the latter is the silicon junction diode, D (Raytheon 1N437A). Thus, transistors V_1 and V_2 correspond to the parallel-connected power-type control tubes (also termed resistor tubes) in

[1]S. Sherr and P. M. Levy, Design Considerations for Semiconductor Regulated Power Supplies, ELECTRONIC DESIGN, July 15, 1956, p. 22.

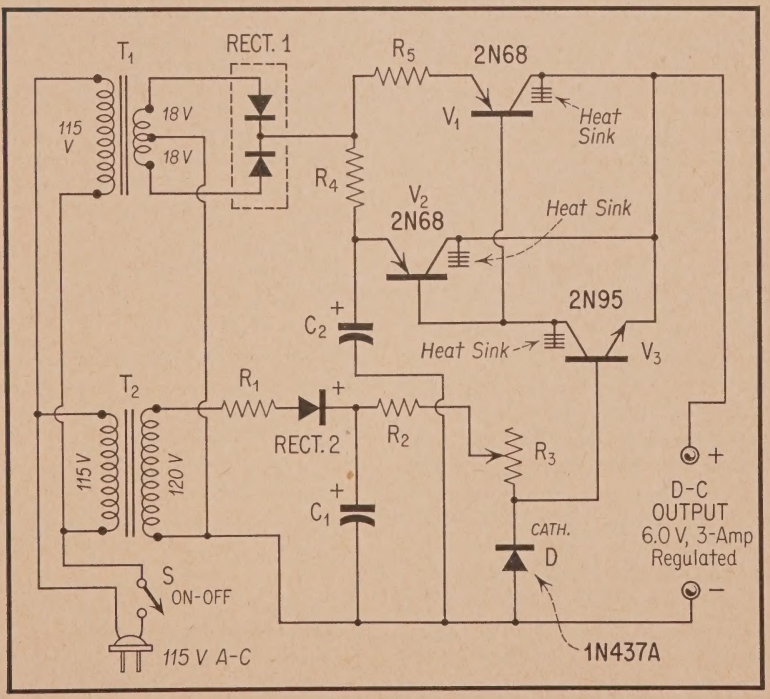


Fig. 4. Low-Voltage 3-Amp. Regulated Supply.

a tube-type regulated supply, transistor V_3 to the pentode amplifier tube, and diode D to the VR gaseous tube.

D-C input is supplied by transformer T_1 and the full-wave selenium rectifier, $RECT_1$. Bias current for the reference diode is supplied by the auxiliary circuit (transformer T_2, $RECT_2$, filter capacitor C_1, and limiting resistors R_2 and R_3). The current is set by adjustment of rheostat R_3 to bias the diode in its Zener region. Biased in this manner, the diode delivers a constant potential of 6 volts dc.

In this circuit, output-voltage variations are sampled by transistor V_3. The base of this transistor is biased to 6 volts by the reference diode. When the output voltage exceeds this reference voltage, a current proportional to the voltage difference flows into the emitter-base input circuit of V_3. This current is amplified in the collector circuit of V_3 and passes into the bases of transistors V_1 and V_2. This amplified current then is amplified further in the V_1-V_2 collector circuit and is supplied to the load. Thus, the diode-biased 2N95 transistor, V_3, provides a feedback path through which the error voltage acts eventually to re-establish the original output-voltage level by supplying additional current to the load through the series-control elements (V_1-V_2).

At 3 amperes output, voltage regulation of less than 1% is obtained. With heat sinks on the transistors, the unit is capable of continuous operation at maximum output with complete safety to the transistors.

Scope of Application

The examples cited in this article serve only to point up some of the ways in which semiconductor devices may be employed in voltage-regulated power supplies. Higher-powered transistors and diodes will permit the design of heavier-duty units. Other types of circuitry also may be used. This comparatively new field of application is expected to become one of the leading industrial avenues for transistor application.

PARTS LIST FOR FIGURE 4

C_1—100 ufd 350 v electrolytic — Cornell-Dubilier BR-10035

C_2—1000 ufd 50 v electrolytic — Cornell-Dubilier FB5010

D—6-volt silicon voltage regulator diode — Raytheon 1N437A

R_1—47 ohms 2 watt carbon

R_2—2000 ohms 2 watt carbon

R_3—10K 4 watt rheostat — Clarostat A10-10K with slotted shaft

R_4, R_5—4 ohm 10 watt wirewound — Ohmite Brown Devil

$RECT_1$—26 v max., 3 amp., full-wave center-tapped selenium rectifier — International Rectifier Corporation D1C15DAGX

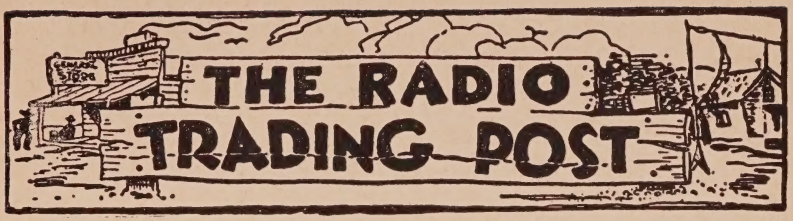
$RECT_2$—120 v, 30 ma, selenium rectifier — Radio Receptor 8Y1

T_1—Rectifier transformer: 18-0-18 v, 10 A — Merit P-3093

T_2—Isolation transformer: 120 v, 50 ma — Merit P-3045

V_1, V_2—PNP power transistors — Sylvania 2N68

V_3—NPN power transistor — Sylvania 2N95



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WANT — Multimeter, course on appliance repair. Have 161mm Kodak 4.5 enlarging lens, 5 x 7 tripod, 4 x 5 holders to swap. Guido Pavan, 2217 Lincoln Ave., E. Palo Alto, Calif.

FOR SALE — IRE proceedings Jan. 1945 to Dec. 1950, $36; Engineering Edition of Radio TV News Jan. 1944 to Dec. 1948, $9; QST Jan. 1942 to Dec. 1950, $16. All FOB. Harry Bremer, 43 Washington Ave., Lake Hiawatha, N. J.

SWAP — Edison cylinder phono 1902 model (small horn) with 12 cylinders all excellent cond. for 16" or 17" TV in good working cond. D. L. Connelly, Hotchkiss, Colo.

FOR SALE — 5 used Seco grid circuit testers GCT-5, in A-1 operating order. Prepaid $7.50 each. L. F. Mach, 402-4 North 24 St., Omaha 2, Neb.

FOR SALE — Rcvr, National NC-98 with speaker. Like new. Best offer over $100. Howard E. Zogbaum, 1112 So. Long Ave., Hillside, N. J.

SELL OR TRADE — 15 w. PA system, complete, $69; GE Tunger batt. charger, $11.50; 7EP4, $14.75; packaging machine aut. tapeshooter, $39; record changer repair rack, $7.75; Disc cutter turntable, $42. Need typewriter. Stollman, 3003 Ave. "X", Brooklyn 35, N. Y.

FOR SALE — Rider, Test Scope Traces, $1.25; Sam's, TV Course, $1.75; Coyne, Radio and TV Instruments and Testing Methods, $1.50; Audel's TV Service Manual, $1. All like new. W. B. Scott, 15 W. Locust, Aurora, Mo.

FOR SALE — 15 2 mfd 600 v. oil cond., $5; 50 assorted condensers, $5; Westinghouse condenser, 2.74 mfd, 2200 VDC, completely oil filled, $4.50. Libby, 126 Bennett St., Port Richmond, Staten Island, N. Y.

WANTED — Used frequency measuring equip. Need snycronometer, interpolation oscillator, standard, etc., any cond. State model, cond., and price. Also need Super Pro SP-400X. R. H. Holsclaw, 2912 E. Mabel St., Tucson, Ariz.

FOR SALE — Coin radios: 6 tube Dahlberg Setchell Carlson, with under pillow speakers, plays 1 hour for 10 cents. 9 sets operating, 6 sets for spare parts. $120 for lot FOB. Leo's Radio and TV Service, 143 State St., Medford, Wis.

WANTED — RME HF-10 rcvr, Pilot T-601 FM tuner, BC-348 rcvr, Stancor St-203A xmitter, GE Ham News (Bound volume). George G. Chandler, Box 251, Patchogue, N. Y.

SELL OR TRADE — RCA Victor UHF TV selector model U-2A; Stancor modulation xformer 80 w. Audio; 4600 v. center tap. 500 Ma. plate xformer. Clarence F. Fanning, Lenexa, Kan.

SWAP OR SELL — 2 meter SCR 522 rcvr complete with tubes for BC 453 190-550 Kc rcvr or $12. J. B. Shinal, 23 Shamrock Ave., Seneca Falls, N. Y.

WANTED — Amateur rcvrs and xmitters, tubes, keys, bugs, headphones, etc. State cond. and minimum acceptable price with first letter. All mail answered. Bill Welsh, 1228 Cambridge St., Cambridge, Mass.

FOR SALE — First tube ever made 27c shipping included. Accept stamps. M. A. Colbert, 310 West 93 St., New York 25, N. Y.

WANTED — Supreme Publications Radio Service manuals, most-often-needed-series, one copy each edition, very good cond., complete. Pay cash or trade radio, TV or ham parts. State price and details first letter. Wm E. Buffington, 5208 Birkenhead Rd., Jacksonville 10, Fla.

FOR SALE — Antique tubes, Marathon 608, Kellog 401, RCA UV200 and 201 and 53 and 89. C. E. Peters, 2925 Apple St., Lincoln 3, Neb.

FOR SALE — Police-Alarm PR-9 FM rcvr 152-174 Mc; perfect cond., $25 plus postage. Carl C. Seidler, 2854 West 29 St., Brooklyn 24, N. Y.

WANTED — Small SW radio and tape recorder plus pocket-midget rcvr. Will trade books, magazines, or govt. gear. Brian C. Smith, 9 St. Margarets Rd., Westgate-on-Sea, Kent, England.

FOR SALE — Rek-O-Kut challenger Disc Cutter: cuts 78 and 33⅓; inter-changeable lead screws, standard and micro-groove; overhead cutting mechanism; like new, list $460, sell for $175. L. Zeiger, 1056 Sherman Ave., New York 56, N. Y.

WANTED — Reciprocating Sander, ¼" Drill, and hand jig-saw. To trade — tape recorder, radios, or state price. W. F. Firehammer, Box 343, R-4, Niles, Mich.

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FOR SALE — 16" RCA Victor table model 16T152-23 tubes. Nice — only $19.95. Will ship anywhere. Jones TV, 1115 Rambler Ave., Pottstown, Pa.

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WANTED — 21FP4A picture tube, for cash if price is right, have used tube tester for $25. Thomas E. Champion, 669 Swan St., Terre Haute, Ind.

FOR SALE — Unused Harvey-Wells TBS 50C xmitter, $75. Lawrence F. Smith, Horse Pond Rd., R. 1, So. Sudbury, Mass.

FOR SALE — Bogen PA amplifier E-620 with Phono, operates on 110 v. AC or 6 v. DC, mike, stand, 2 10" speakers in carrying cases. Best offer. Jack Boritz, 1560 Unionport Rd., Bronx 62, N. Y.

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WANTED — Hallicrafter S-94 civil patrol rcvr or police-alarm FM rcvr for 30 to 50 Mc band. For cash, any cond. or what have you? Frank Ainoris, RFD Lincoln Ave., Holbrook L. I., N. Y.

FOR SALE — DuMont 5" 274 scope, l. n., $60: Philco 7070 AM RF generator, 100 Kc to 112 Mc, $35; Parmetal commercial grade cabinet rack, 76" on casters, $50. Chester Kulwiec, 84-19 150 St., Jamaica 35, N. Y.

WANTED — Johnson 275 w. Matchbox or Heathkit AC-1. State price delivered. J. Coffield, 1731 West First St., Brooklyn 23, N. Y.

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FOR SALE — Rider manuals $4, $7, and $12; Vol. 1 TV manual, $15; Rider automatic record changer and recorder, $2. National Radio Service, 594 Larkin St., S.W., Apt. 567, Atlanta 14, Ga.

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WANTED — Ship-to-Shore phone must be small and able to license. Also depth indicator. Jack Miller, 4615 Laurel, Bellaire, Texas.

WANTED — Wire-recorder spools, with used wire, must be reas. Henry J. Orloff, 565 N. Alexandria Ave., Los Angeles 4, Calif.

WANTED — Modulation xformer, multimatch type, for 500 w. input. CVM4 or CVM5 preferred. E. Belmont, 1304 Third Ave., Asbury Park, N. J.

WANTED — Recent tube tester, FM tuner, Stancor xformer PC-8412, output A-8054, and choke C-1410; 1949 Dodge radio with dash plate, 15" speaker. K. S. Lyons, 168-70 93rd Ave., (rear), Jamaica 3, N. Y.

SELL OR TRADE — Photograph books on specialized subjects; Crosley 1117 rcvr with long-wave and two short-wave bands, no cabinet, $20 or trade for test equip. or parts. Myron L. Braun, 202 Howard St., Bellevue, Ohio.

WANT TO BUY — 12 WP4 picture tube. Bobs Service Shop, 366 Summer St., Oakland, Me.

WANTED — 30-50 Mc FM rcvr or auto radio for 54 Chev. Have surplus gear or will pay cash. F. D. Donovan, 101 Winthrop St., West Medway, Mass.

FOR SALE — Assorted condensers; bathtub, oil filled, electrolytic, mica, ceramic, reasonable; Hallicrafters S-85 rcvr. 1. n., $95; Johnson signal sentry, $12 post paid. Bob Sturman, 1241 Virginia Ave. NE., D-4, Atlanta 6, Ga.

FOR SALE — 50 coin operated radios suitable for hotel, motel, hospital or home. Guaranteed and ready to use. Cost $75 each. Buy one or all for $17.50 each. University Store, 19 Lincoln, Youngstown 2, Ohio.

SELL OR SWAP — Tubes: 2, 1B22 (radium), 2, 725-A, 2, J21A (Magnetrons), 832A, 6, 6J4, 2K25-723A-B, 6, 9002, 2C40 and 2C44 (Lighthouse). All like new. Roy T. Beaver, 818 Sherwood Rd., Charleston, W. Va.

FOR SALE — Genuine RCA Treasure Chest tube and tool caddy. Practically new, $7.50. Paul Richter, 1448 Webster Ave., Bronx 56, N. Y.

FOR SALE — Meissner 8C FM tuner with cabinet, low amplifier home-brew; SX-24 Hallicrafter rcvr. Stanley Buckwalter, 61-41 Saunders St., Rego Park 74, N. Y.

SWAP — Improved Gonset 3-30 mobile converter with 6BE6 mixer and tuned IF, for good 20K ohm-v. VOM or other test equip. O. Kolen, 995 James St., Apt. 8, Syracuse 3, N. Y.

FOR SALE — Motorola T-69-20-A trans and matching power supply, $45; Eico 320 sig. gen., $18.50 and 425 scope, $35; Riders TV manual 17, $18.50; Sams radio folders 83-19-3 all for $2.50. All FOB. Robert Schmauss, 3903 Swann Ave., Tampa, Fla.

WANTED — Government Technical Manuals. State ones you have and price. Will pay cash or trade surplus radio and electronic parts, etc. John Skane, Halifax 1, Pa.

FOR SALE — Auto radios perfect cond., low prices, send for information. Bernie's Radio TV, 227 Riverdale Ave., Brooklyn 12, N. Y.

SELL OR TRADE — Stancor 110C all band xmitter, BC458, BC459, 2 TP6, 1185v.-500M xformers, AT-1 TV booster 866 A with 10 amp fil. xformer, 7.65mm Belgian rifle. Chester E. Newell, 136 High St., Oil City, Pa.

WANTED — 15" Hi-Fi speaker or set of speakers to cover 25 cy-17 Kc. A-1 quality, like Altec-Lansing Warfdale RCA, Jensen. Also want good electronic organ such as Wurlitzer, Conn, or Allen. G. E. Howarth, 216 1st Ave. East, Oskaloosa, Iowa.

FOR SALE — Miscellaneous Sams Photofact folders, $1.00 each. W. B. Scott, 15 W. Locust, Aurora, Mo.

WANTED — Hallicrafter SX-28 cabinet. Dave Fornshil, Apt. 3, 1015 East Washington Blvd., Fort Wayne, Ind.

FOR SALE — Books: Mandl's TV Servicing, American Electricians' Handbook, Wiring Simplified, Servicing TV Rcvrs; Audel's New Electric Library, tube tester. Mrs Kathryn Clemson, 1107 E. McClure, Peoria, Ill.

SELL OR SWAP — U.S. Army rectifier RA9; GE line xformer 110 v. AC into 440, 500 w.; 8" 150-0-150 Weston v. DC meter and case, etc. Need good 35mm camera. Vick Siech, 703 La Plaisance St., Monroe, Mich.

WANTED — Exacta 35mm camera or reflex housing for Leica 3C, and 600B tube checker in exchange for machine shop tools, milling cutters and end mills, ball bearings. Henry Schneider, Box 144, Elmont, N. Y.

FOR SALE — Portable X-ray machine 85Kv at 40 ma, $150. Prefer local. Wm. R. Holleran, 323 Garland St., Pittsburgh 18, Pa.

FOR SALE — National 88 rcvr, used less than 10 hours. Asking $90 plus shipping; also NRI Radio-TV course, less kits, $15. N. Klock, 227 Fenimore Ave., Uniondale, L. I., N. Y.

FOR SALE — AEI A-200, sig. gen., calibrated against Bureau Standards, 1. n., $16. Edward Summers, 3605 Janet Rd., Wheaton, Md.

FOR SALE — Stromberg-Carlson 119 CM TV chassis with speaker less picture tube, needs power xformer, best offer. G. D. Griffin, 322 W. State St., Ithaca, N. Y.

WANTED — Position in electronics field. Have servicing background and experience, radio-TV appliances, all types comm. equip. etc. 24 yrs. old, K-vet, married. Future primary consideration but temporary position considered. Contact Ron Bacon, 4 Cayuga St., Auburn, N. Y.

WANTED — 25 or 30 w. amplifier in good shape, also 8 or 16mm movie projector. Have cash and items for swap. John Arnold, Wilson St., Bluffs 3, Ill.

SELL OR TRADE — Dumont 241 Precision 5" scope, excellent cond., $160 or trade for good mobile gear. S. Consalva, 4905 Roanne Drive, Washington 21, D. C.

SELL OR TRADE — 2 each 275-AR, 274-AR, 276-AR and 8 each MX273-AR spring loaded antenna insulators. Dick Platt, Box 234, Summerland, Calif.

FOR SALE — Knight AC-DC "Ocean Hopper" kit, 2 coils, instructions, 1. n.; Keystone 8mm camera, portable light bar, 2 bulbs, perfect. Best offer. Harry Moses, 3907 Ventnor Ave., Atlantic City, N. J.

FOR SALE — Car radios for 1946-47 Studebaker, Buick, Pontiac and Olds; for 1950 Packard and Olds, also 41 Buick and 48 Olds. All A-1 cond. Fenter's Radio Service, 107 W. Bond St., Attica, Ind.

FOR SALE — Heathkit 0-11 color scope, assembled, perfect cond., $75. James Kokkinos, 86 Grand St., Kingston N. Y.

WANT — Monitoradio FM rcvr two bands, 30-50 Mc. and 150-174 Mc. Cash or trade Triplett 666 meter, many RCA and GE tubes, Simpson 260 meter, all 1. n. W. J. Erb, 3064 North "A" St., Philadelphia 34, Pa.

SELL OR TRADE — Over 80 used 6 v. auto radios, both panel and rear of dash types, $150 or Precision E-400 sweep generator in 1. n. cond. Will not ship. F. J. McNulty, 50 A Vernon St., Worcester 10, Mass.

WANT — Ultra-violet light lamp for minerals; metal detector. State model. Will pay cash or trade TV test equip., etc. Wm. Barber, 381-A Oak St. Ext., Lowellville, Ohio.

FOR SALE — Eico 1040 6 v. battery eliminator, 1. n., used only a few times, $15. John Makar, Box 707, Export, Pa.

FOR SALE — GE 250 portable radio, reasonable price. Make offer. Schroeder's Radio Service, Osage, Iowa.

WANTED — Police alarm radio or any rcvr covering 30 to 50 Mc. FM, any old FM set covering 42 to 50 Mc., need not be in working cond. Will pay cash or trade. Carl J. Fritz, 2816 F St., McKeesport, Pa.

WANTED — Old tape recorders, any cond. State make, cond. and price. Roy Swartz, 497 East Farming St., Marion, Ohio.

SELL OR SWAP — Eico 425 scope and 360 TV-FM sweep gen.; Radio City tube tester 323; Feiler stethoscope sig. tracer, TS-3A; Readrite 432A tube tester. Cash or what have you? Robert Shingledecker, Rt. 2, Bellevue, Ohio.

FOR SALE — Toastmaster, restaurant type, $35; Clark 5" electric sander, $25 both like new; GE fast battery charger, $35; 2 portable radios, $15 and $20. Or will trade. Hickok 534 multitester, $80. H. L. Nostrand, 3 London St., E. Greenwich R. I.

SELL OR TRADE — Gonset 20-meter converter $15; Mallard Hi-Q loading coils, 20 meters, $5, and 75 meters, $4; approved V12 FM-AM tuner with power supply, $25; auto radios 1938-1950 reasonable. Want 6-12 v. battery eliminator. S. Martin, 722 Pennsylvania Ave., Elizabeth, N. J.

WANTED — 17" "Teleking" TV. State model cond., and price. H. C. Adams, R 10, Box 266, Richmond 24, Va.

SELL OR TRADE — Collectors Item — Science and Invention: May 1923-April 1924, all in binders; Modern Radio Servicing and Radio Field Service Data, by Ghirardi 2nd ed., 1936. Best offer or what have you? John Rosol, 28 Winans Ave., Newark 3, N. J.

FOR SALE — Westinghouse 1½ hp. motor, ball bearing, 1" shaft, 3-phase reversible, $30. Want BC 348 or 8mm movie projector. Harry M. Breed, Jr., Box 8662, Ensley, Ala.

WANT — To buy or trade 110 v. power supply for Command rcvr 274N, other radio equip. State price and cond. Will trade HO gauge railroad equip. D. J. McKenzie, 2119 Douglas, Rockford, Ill.

TRADE — Rider Manuals, vols. 1 to 11, 13, 16, 17. Want either good scope or BC348 rcvr. Martin Bedecs, 614 Parker Ave., Kalamazoo, Mich.

WANTED — Triplett 3296 modulation monitor. Hollis Baird, Northeastern University, 360 Huntington Ave., Boston 15, Mass.

WANTED — Revere T-700 or TR-800 tape recorder. Eugene Kon, 1516 Broadway, Buffalo 12, N. Y.

WANTED — ART13 driver xformer. S. Ladage, 431 Oakland, Maple Shade, N. J.

FOR SALE — 40 and 80 meter xmitter with power supply, $20; 10 meter without power supply, $10. A. C. Indovino, 336 Randolph St., Rochester 9, N. Y.

WANTED — 3 or 4 speed automatic record player and tape recorder for cash or swap for Underwood desk model typewriter, electric hand saw, 7½ hp. Mercury outboard. H. Kaye, 9409 Ave. A, Brooklyn 36, N. Y.

SELL OR TRADE — "C" model SCR-522 with AC power supply; dynamotor 6v-500v, 200 ma; RCA 45J2 phono attachment with Sonotone cartridge. Need hi-fi equip., especially speakers. Walter Smith, 307 Pleasant, Charlotte, Mich.

FOR SALE — Candler Code Course, $5; 1. n. - 45rpm auto. player attachment, $15. Send money order or will send COD. Eugene Cheney, Box 308, Nora Springs, Iowa.

FOR SALE — ART-13 final variable condenser, $4; Pict-O-Guide, vol. 1 and 2, $1 each; Radio Manual, Sterling and Monroe, 4th Ed., $6; TV Communication correspondence course, except kit, $15; Jackson signal generator 640, $15. H. Howard, 100 N. Maxwell, McPherson, Kan.

FOR SALE — Hickok tube tester and signal generator; Meissner analyst; 6v. battery eliminator; Eico 5" scope; Heath VTVM; Seco grid tester. Donald Aden, 414 N. 39th St., Omaha, Neb.

FOR SALE — All Heathkit: OM-1 scope, PS3 power supply, and T3 signal tracer; Superior TC 55 tube checker. Robert Fellows, Caledonia, N. Y.

WANT — CQ full year of 1945 and various fill-in issues 1949 to '56 CD Capacitor vol. 1 1937, vol. 2 1938, vol. 3 1939; QST Dec. 1915, complete 1916; ARRL Handbook vols 2-5. Bob Jones, 713 Front St., Catasauqua, Pa.

FOR SALE — Eico 460 DC wide-band 5" scope, completely wired and assembled, factory checked and calibrated, with instructions, never used, $90. L. Wagner, R. 1, Wapakoneta, Ohio.

FOR SALE — Hallicrafter SX-24, fair cond., less speaker, $35 plus shipping; Radiart vibrapak 12 v. input, 300 v. 100 Ma output, $6 plus shipping. S Ackerman, 57-47 Marathon P'way, Littleneck 62, N. Y.

FOR SALE — Two Alliance Tenna-scope TV boosters and Regency TV signal booster, less tubes, $11 each. Geo. Vuletich, 225 Penna., McDonald, Ohio.

FOR SALE — 800 tubes, scope, VTVM, VOM, tube testers, sig. gen., condenser and resistor analyzer, Rider manual, cabinets of resistors and condensers, books, TV sets, used radios and other test equip. Frank Kesto, R. 1, Lyman Rd., North Rose, N. Y.

FOR SALE — Most complete Radio-TV shop in New England, started 1919. Draws from 40-mile radius. Modern equip., tools, manuals. Will also sell or rent building — 2 stores, 2 apartments, available immediately. Mrs. Pearl B. Brown, 124 Main St., Meredith, N. H.

FOR SALE — Radio Craftsman 800 FM-AM hi-fi tuner-preamp, exc. cond., also Motorola UHF converter. Best offer. Federighi, 137 Oxford St., Cambridge 40, Mass.

SELL OR SWAP — Kalart "Super Speed" flash with test bulb and calculator bracket, protection hood, and flash cable. Cost $16.50, used twice. State price in cash or what you have to trade. Al Roman, Jr., 40 Wilcox St., Dumont, N. J.

FOR SALE — Eico 425 5" push-pull scope, practicaly unused, $25. Jim Taylor, Reed, Okla.

FOR SALE — RCA Review 1946 to present, AIEE Communications and Electronics 1952 to present, both $1 per year plus postage. Make offer for unused 5 HP4, used 5BP4 scope tubes, pair 5 selsyns. R. A. Lebowitz, 1890 E. 5 St., Brooklyn 23, N. Y.

FOR SALE — Jackson 106 sig. gen. 100 Kc. to 216 Mc.; Philco 7053 Cathode Ray tube checker 1. n.; battery eliminator Motorola 6 v., $60. John's Radio and TV Shop, 604 Charles St., Providence 4, R. I.

SELL OR TRADE — "Radio" magazine in binders 1939 to 41; Vol. 2 Hints and Kinks; TV bar generator; ARRL Handbooks 1936, 38 to 40, 44 to 47, 50, 54. Need back copies of "Radio" Handbook not ARRL. Carl A. McKay, 4144 Meda Pass, Fort Wayne 6, Ind.

TRADE — Instructograph and 5 tapes, with Bud code oscillator, for Morrow 3BR, 3-band converter, for 80, 20, and 10 meters. C. L. Piester, Box 594, Fort Collins, Colo.

WANT — Amateur xmitter or rcvr, factory built for AC operation in trade for 35mm color slides, 16mm silent feature films, 35mm filmstrips. Walter G. Steed, 3108 Oxford Ave., Nashville 6, Tenn.

WANTED — Schematic diagram of RCA 16 x 14 push button rcvr, made in 1940 or 1941. Charles H. Connor, 808 N. Wabash Ave., Chicago 11, Ill.

SELL OR TRADE — 144 Sams Photofacts. Interested in movie camera or equip. Eugene Hice, R 5, Hamburg, N. Y.

SELL OR TRADE — NC57B, good cond., $50; Budd xtal calibrator, meters, tubes, misc parts. Need late direct exposure meter, Kodak E2 processing kit, accessories for Contaflex I. R. A. Williams, 4506 W. Slauson Ave., Culver City, Calif.

FOR SALE — Old-time radio tubes: 01A, 112-A, 1V, 22, 12-A, 12A5, 12A7, many others. Anderson's Radio Service, 44 B Limestone St., Caribou 6, Maine.

FOR SALE — Bendix TA12 xmitter in sealed waxed case, $29.50; Bendix RA-10DB rcvr with head, $29.50; AR2 rcvr, serviceable, $37.50. Jas Slater, Kingston, Nova Scotia.

FOR SALE — 106 standard radio tubes unused, in original cartons worth approx. $236, sell for $80. W. L. Bowden, 123 Grove St., Dexter, Me.

WANTED — RCA Radio rcvr chassis 910KG, need not be working, but RF coils must be in good working cond. Will trade RCP 730 AM-FM sig. gen., in working cond. with cabinet. Albert Blizzard, Riverton, W. Va.

WANTED — Used books, articles, schematics, etc., about electronic organ. Elmer Bensen, 1006 Prairie, Joliet, Ill.

SWAP OR SELL — Radio parts, books, and magazines for early U.S. stamps and high speed drill bits. 1/32 - 1/4. J. S. Clamin, Box 61A, Beulah, Mich.

FOR SALE — Unused 59 Simpson 4" AC voltmeter 0-10 v; Rek-O-Kut overhead cutting mechanism M-12 with TR-12 turntable in good shape; Masco 4 channel EMM-6 mixer; Electro-voice 911 mike. Ernest Tucker, Box 25, Fayetteville, Tenn.

FOR SALE — Alliance AB and Astatic BTI boosters. Make offer. Want RCA WO55A 3" scope. Botbyl Radio Shop, 1009 Sophia, Muskegon, Mich.

WANTED — BC-221 with or without original calibration chart, also need back issues of ARRL Handbooks, QST's and CQ's and issues 1, 3, and 4 of ARRLs "Hints and Kinks." W. D. Richardson, 275 Marion Ave., Painesville, Ohio.

SWAP — 4"x5" metal view camera, all adjustments, with lens and shutter. Want good tape recorder or cash. J. D. Everson, 920 Oatfield Rd., Gladstone, Ore.

FOR SALE — Volumes 1-20 Sams Photofact service, cond. excellent, a collector's item, $400 with binders. James H. Moran, Box 194, Kittery, Me.

FOR SALE — Eico 320 RF and Heath SG-8 RF signal generators, $16.50 each; Knight capacitor checker, $10; Granco UHF converter, $10. ARV Electronics, 5834 Pershing, Houston 21, Tex.

WANTED — Lamkin 105B and 205A; FCC approved two-way communication equipment, 25 watts or more, in the 468-470 Mc. band. Give cond. and price. M. H. Hart, Box 243, Rochester, Vt.

FOR SALE — 11 Micas-0.02 mfd, 1000 v., $9; 13 Micas-0.002 mfd, 2500 v., $7; 15 Micas-0.05 mfd, 600 v., $6; or all for $20. P. Berge, 245-32 76 St., Bellerose, N. Y.

WANTED — Simpson volume unit meter, illuminated preferred, like model 142, 3½" scale, 4¼" case; DB volume level meter of same size, and both in excellent cond. Cash. James E. Tunnell, Box "B", St. Cloud, Minn.

SELL OR TRADE — Radios: Traveler 50 28A 3-way portable; Stewart-Warner 900 7A portable; Sparton 61 combination, standard and short-wave, $11 each, or $30 for all three. All good. Dana D. Davis, Rt. 3, Unionville, Mo.

FOR SALE — Up-to-date Superior TV-50 genometer, never used, in original carton with instructions, $35 prepaid. E. O. Terry, Rt. 7 Box 91, Roanoke, Va.

TRADE — VOM for a record player; or trade S40A Hallicrafter comm. rcvr for Hi-Fi amplifier. Wendell, 63 Forest Hill Pkwy, Newark 4, N. J.

SELL — Enclosed par-metal relay cabinet, black crackle, hinged doors top and back, panel space 21"x19½"x14". Best offer. New York City area only. Walter Bieber, 1323 Eggert Place, Far Rockaway 91, N. Y.

FOR SALE — GL 299 xmitter tubes GE original boxes, no reasonable offer refused. P. Lowe, 65-53 160th St., Flushing 65, N. Y.

WANT — Factory Service Station repair manuals for electric trains, (Lionel, American Flyer etc.) for cash. Radio and Electric Service, 246 Jefferson St., Tiffin 12, Ohio.

FOR SALE — Apex transistor and diode checker; Triplett 0-1 ma. meter connected to jacks for external use, 1. n., $18; transistorized metal locator, $45; 5" ball bearing jointer, $35. Bourcham, 127 Great East Neck Rd., Babylon, N. Y.

FOR SALE — ARC-5-R28, operating on 110 v. AC, less speaker and crystal; FM fixed frequency rcvr, 152-162 Mc. with speaker less crystal, operates 110 v. AC. William Ryan, 2600 W. 50th St., Chicago 32, Ill.

TRADE — Factory wired and tested Eldico TR-75-TV 60 w. C. W. xmitter with 2 sets of coils. Need 35mm slide projector. Doyle Haywood, Newbery, Ind.

SELL OR TRADE — Sonar FM exciter, model XE-10. Want 35mm camera or what have you? Louis E. Brown, 2115 Melbourne, Dallas, Tex.

WANTED — Meissner Instruction Manual containing schematics on all Meissner kits, 168 pages, published about 1942. Needed for five-band Meissner rcvr with tuning eye. A. W. McAuly, 409 North Ave., Verona, Pa.

FOR SALE — FM tuner, 10 tubes, AFC, made by Brooks. Just reconditioned by Audio Exchange. Best offer. Arthur Freund, 17-87 166 St., Whitestone, N. Y.

SELL OR TRADE — RCA 167A test oscillator, 1. n.; Signal Corps U.S. Army output meter, by Triplett; Sylvania comb. radio and geiger counter, portable, I. n. W. R. Schalla, 1801 Illinois Ave., Lansing 6, Mich.

SELL OR SWAP — Heath AT-1 with Oct. 1955 QST modifications and VF-1 VFO, both $40. Want Matchbox or Z-Match coupler. C. E. Hurst, Rt. 5 Box 365, Springfield, Mo.

WANTED — Walkie-Talkies suitable for conv. to 50 Mc., or other 50 Mc. equip. Have AT-1, tubes, crystals, or cash. Mike Trimble, 3222 Cook St., Omaha, Neb.

FOR SALE — Complete Precision lab.: ES-500E scope; EV20-VTVM, E400 sweep; E200C sig. gen. All in perfect cond., $250, or sell separately. Fred E. Saron, 844 E. 13 St., Brooklyn 30, N. Y.

SALE OR TRADE — VHF 2-13 21" TV kit in original carton, $90 plus express charges. Pictorial and schematic diagrams incl. Trade for test equip. R. Fannin, 115 E. Broadway, Jackson, Ohio.

SELL — MIT radiation laboratory series, 28 volumes, perfect cond., $125 plus shipping. Fred M. Wiglusz, 434 Carter Ave., Pawtucket, R. I.

FOR SALE — QST by the year 1948 through 1953. 12 copies, $1 plus postage. Neil Johnson, 10 North 10 Ave., Mt. Vernon, N. Y.

SELL — Bargains in ham gear, tubes, xformers, capacitors, meters, all kinds of parts, magazines, etc. Arthur Johnson, 29 Boone St., Bethpage, N. Y.

FOR SALE — Radio service manuals, postpaid: Riders 1-14, make offer; Zenith vols. 1, 2 comb., $2.50; NRI vol. 1, $8; RCA vol. 2, $3.50; Supreme 1, 2, 3, $1 each; Supreme record changer man., $1.50. Harold Garrett, 711 South N. Y., Sedalia, Mo.

WANTED — McMurdo-Silver 911 and Precision E400C sweep generators; latest FM or AM-FM tuners, i.e. Heathkit. O. Zetlmeier, 1123 Woodycrest Ave., New York 52, N. Y.

FOR SALE — Silver Marshall "B" eliminator, 3-post, $15; German "Multavi I" volt-amperemeter, 5 v. ranges from .03 v. to 300 v. DC, 5 ampere ranges from .003A to 15 amps, in portable case, $25, plus express; ATR Inverter Model EL1A, $15. All FOB. Albert Hart, 207 N. Raymond St., Griffith, Ind.

SWAP — Model 70 cal-270 rifle, 4X scope. sight, dies and components for factory-wired Viking II. C. R. Faulkner, 106 N. Main St., Somerset, Ky.

SELL OR SWAP — Supreme 576 sig. gen.; Radio City dynoptimum tube tester model 322A, 110 DC, 110 AC 250 w. converter, for cash or handguns. Omar Electric, 9714 Dodge Lane, Franklin Park, Ill.

FOR SALE — Heath OM-2 plus 337-C and 342, $40; BE-4, $20; IB-2, $50; RCA TV T-100 (not wk.), $15; 4 power xformers, $5. Mrs. E. Miller, c-o Decker Trailer Court, Mt. Rd., Middletown, Pa.

SELL OR TRADE — "00" guage Lionel train and equipment worth $125; "Original" deluxe vibroplex bug. Need good scope, grid-dip meter, tube tester, Johnson Matchbox, VTVM or commercial ham gear. F. E. Shanks, 38533 31st. St. East, Palmdale, Calif.

FOR SALE — 25 coin-operated radios, good cond. Gene Davis, 3845 N. Union, Des Moines, Iowa.

FOR SALE — Wilcox-Gay deluxe tape recorder and Webcor Coronet, either or both for best cash offer. Dan Bruno, 28 S. Bow, Milford, Mass.

FOR SALE — QST odd copies 1934 to '40; Radio, odd copies 1936 and solid June 1937 to March 1942 in binders; Voightlander 9x12 cm. film pack camera and case. Arnold Ely, 2484 Michigan Ave., Niagara Falls, N. Y.

WANTED — Small 12 v. DC blower for car, with heater preferred. State cond. and price. Gerard A. Baldauf, 3137 Philmont Ave., Huntingdon Valley, Pa.

WANTED — VHF Aircraft radio rcvr or transceiver, state make, cond., and price. Chas. F. Meier, 308 N. 3rd St., De Soto, Mo.

SELL OR TRADE — Webster-Chicago 618 amp; RCA Radiola 18; Buick Sonamatic car radio. Need 17" used TV, Riders manuals. Clarence J. Reed, 33 N. Grape St., Mt. Carmel, Pa.

FOR SALE — Eico 360 TV-FM sweep gen., with 5 Mc. xtal, $10; Heath VF-1 VFO, $10; home-made modulator for AT-1 xmitter PP 6L6 with xtal mike, $20. George F. Franklin, 505 South Fillmore Ave., Kirkwood 22, Mo.

SWAP OR SELL — GE instrument potential xformer 2300 to 115 v., Type E6, $15; excellent wall type, 5 bar gen., farm telephones, $15 each. Want old guns. T. E. Huddleston, 4706 No. 36 Ave., Omaha, Neb.

FOR SALE — 800 assorted ½ and 1 w. resistors, $8; 40 HB Jones P312AB and P310AB connectors, $5; 10 condensers West. Elec., 2.5 mfd, 250 v. DC, $5. M. Kalmanson, 80 St. Marks Pl., Staten Island, N. Y.

FOR SALE — Hickok TV-Radio test equip.: 209A, PR30, 620, 600A, and CRT tester, Sprague T03, field strength meter, Sam's 81 to 216 in binders. Royal Craft, Madison Lake, Minn.

WANTED — Rcvr with major electrical difficulties. Need be complete mechanicaly only. Howard Kiker, 126 Rudderow Ave., Mt. Ephraim, N. J.

FOR SALE — Webcor 178 wire recorder, has recording meter, pre-amp, mike and 3 spools of wire, $40. Bernard Alexander, 1547 Munn Ave., Hillside, N. J.

TRADE — Bell disc recorder RC47A, (value $117); Webster wire recorder, all accessories and extras (value $250) for typewriters, portable tape recorder, Hi-Fi, citizens radio units (20 mile range); late Walkie-Talkies. Dave Fisher, Box 125, Monroeton, Pa.

FOR SALE — Radio Specialties Tri-band beam for 10-15-20 meters. Want Gonset Marine converter 3003 for 1.6 to 6 Mc. G. W. Brooks, 18 Country Way, Greenbush, Mass.

WANTED — Phonetron speaker of 1921 made by Continental Radio and the Radio Magnavox speaker of 1921 by Magnavox. John Prentiss, 3116 Home Ave., Berwyn, Ill.

FOR SALE — Burgess Vibrotool and extra attachments, never used, $5. Doty Radio Service, 71 Rita St., Dayton 4, Ohio.

FOR SALE — University 600 cy. crossover network, 6 to 16 ohms with H-F level control, l. n., $15 postpaid; Audak HI-Q7 phono cartridge with two diamond styli, l. n., $30 postpaid. J. Leonard Herron, 6340 Magnolia Ave., Chicago 40, Ill.

FOR SALE — 50 assorted xmitting micas, 600 v., $10; 2 T-17 microphones, $5 each; 100 condensers, 1.32 mfd, 100 v., $7. G. Huether, 149 Greenway W., New Hyde Park, N. Y.

FOR SALE — Hallicrafters S-76 double conversion rcvr, excellent cond., $90. Mike Yacenich, 105 Elm Drive, Trafford, Pa.

WANTED — To buy several tape recorders at $30 each. Bob Gawell, 316 W. Washington St., Winamac, Ind.

FOR SALE — University Diffusicone 8 speaker ($23 audiophile net) in RJ type cabinet. Best offer over $25. R. Rosenbaum, 396 Hinsdale St., Brooklyn, N. Y.

FOR SALE — Knight "in circuit" capacitor checker, l. n., $15. Erwin Eichelberg, Leola, S. Dak.

FOR SALE — AIEE Journals, Power Plan Engineering magazines, prewar Deforest Radio Course, Rider Record Changer manual. D. C. Harrington, 2508-B 36th St., Los Alamos, N. Mex.

FOR SALE — Radio and TV News, Electronic Engineering edition 1951-1954, old Astounding magazines; Johnson 122-101 sockets for 829, etc., 2 for 75c. Swap for meters, parts, etc. V. Johannes, 1541 Metropolitan Ave., Bronx 62, N. Y.

SWAP — Kodak 2-C autographic camera with leather case complete; Sam's TV Photofacts. Want Hickok test equip. Jack Mosers Shop, R 1, Lewisburg, Pa.

SWAP — Webcor tape recorder in superior cond. Want clean Hallicrafter SX-62. Walt Bartell, 5536 Wilson Ave., Chicago 30, Ill.

FOR SALE — Hickok 534, $60; 288X, $99; Simpson 260, $25; Precision 954 tube checker, $50; E-400 SW, $65; VTVM, $35; BC 221, $75; ATR 6 v. supply, $20; Granco conv., $20; Pilot FM tuner, $25. J. Pellock, Benld, Ill.

SELL OR TRADE — Knight "in circuit" capacitor checker, l. n. with schematic and directions, guaranteed, $10 or swap for 2-tube UHF converter in similar cond. W. R. Brown, 407 Deckbar St., New Orleans 21, La.

FOR SALE — DX-100 xmitter in unopened carton, liquidating estate, $170. Tajbl, 1319 S. Cuyler, Berwyn, Ill.

FOR SALE — Airking table model A-403 Radio-Phono 78 rpm single speed, $11 post paid. Surplus Signal Corps. radio xmitter 168 freg. 500 Kc. less battery. Best offer over $15. R. M. Massey, 423 Monroe St., Philadelphia 47, Pa.

SWAP — Duotone GEDS phono stylus GE RPJ-013, dual .001 diamond and .003 sapphire. Need diamond LP stylus RPS-004 for GE RPX-040 cartridge. Eddie K. Snyder, Box 115, West Unity, Ohio.

FOR SALE — National SW3 with power supply and coils, MKII B19 xmitter — rcvrs; Hallicrafters S20R and S41. A. Kaiser, 1331 Dayton St., Camden 4, N. J.

SELL OR TRADE — GE YGA-4 audio oscillator; SCR 522 transceiver, complete tubes, unmodified and conversion manual. Need tape or wire recorder or Photofacts. Dick Platt, Box 234, Summerland, Calif.

WANTED — Small adding machine; small PA system. Cash or trade test equip. Robert L. Weil, 50 Laing St., Albany 5, N. Y.

FOR SALE — Simpson 260 VOM roll top and HV probe, l. n., $40; Granco 610 FM rcvr needs minor repair, $15. J. Mariani, 549 W. 113 St., New York City 25, N. Y.

FOR SALE — 250 w. fone rig, 814's in final, 3 power supplies, 500 v.-750 v.-1000 v., built in Budd 30" cabinet, relay controlled, $100. Steward Ringler, 121 S. 11th St., Reading, Pa.

FOR SALE — Precision tube test master 10-54 portable, l. n., $90 with leads and instruction book; 150 Radio-TV tubes ½ wholesale price; Supreme audio osc. to 15 Kc, $15. P. T. Pickei, 1585 Unionport Rd., New York 62, N. Y.

WANTED — Aircraft BG ignition harness test set, M-652 or M-660, in working or repairable cond. Specify price and cond. Theodore M. Korch, 612 Sycamore St., Rahway, N. J.

FOR SALE — Hallicrafters: SX-88 rcvr, $375 and S-85, $85 l. n.; all types condensers. R. S. Sturman, 1241 Va. Ave. N. E., D-4, Atlanta 6, Ga.

WANTED — Schematic diagram fdr RBG-2 radio rcvr, Navy instruction manual preferred, cash price? H. D. Vorhaver, 422 So. Grant, Manassas, Va.

SELL OR TRADE — Webcor 3-speed changer with GE cart., Telex 2000-ohm hearing aid phone, both excellent cond. Want Belmont Boulevard or other pocket radios, FM-AM tuner, Cascode tuner. Oliver A. Zucco, Granite Ave, Ext., Canaan, Conn.

WANTED — Hallicrafters SR-75. Must be complete and in A-1 cond., for cash. J. Schmidt, 85 Livingston St., Brooklyn 1, N. Y.

WANTED — Jackson TVG-2. Have Turner dynamatic mikes 75% off to sell. Write for mod. number. Lucien Michaud, 303 Belaire St., New Bedford, Mass.

FOR SALE — Fresh'nd-Aire (Cory) D750B portable electric dehumidifier, 115 v., up to 2 gallons in 24 hours. Like new, $60. G. A. Liptak, 58 Wonham St., Clifton, N. J.

WANTED — Diagram for Gotham 8121 amplifier. J. Sidoine, 2120 Madison Ave., New York, N. Y.

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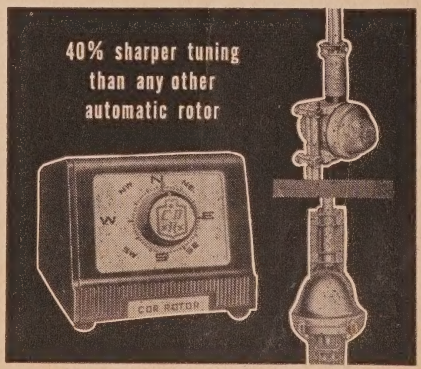

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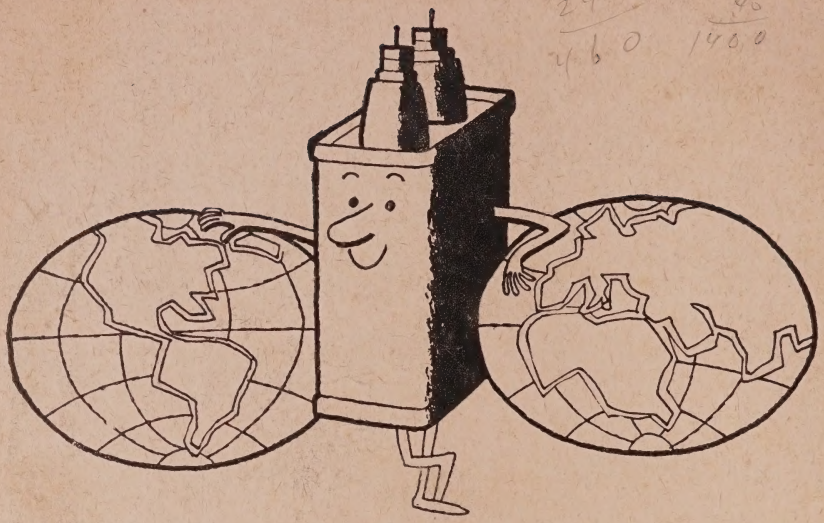

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